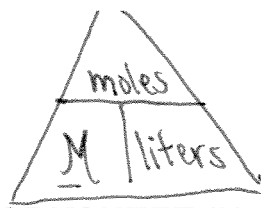
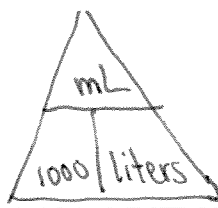
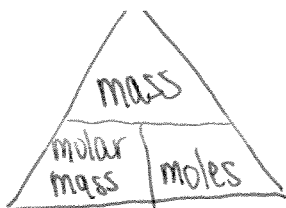


Name \_\_\_\_\_

Period \_\_\_\_\_

**MOLARITY WORKSHEET #1**

For each of the following problems, use proper units and show ALL work:

1. If 10.7 grams of  $\text{NH}_4\text{Cl}$  is dissolved in enough water to make 800 mL of solution, what will be its molarity? (Answer: 0.25 mol/L).

$$M = \frac{\text{moles}}{\text{liters}} \rightarrow \begin{aligned} \text{moles} &= \text{mass} \div \text{molar mass} \Rightarrow \frac{10.7 \text{ g}}{53.5 \text{ g/mol}} = 0.2 \text{ mol} \\ \text{liters} &= \frac{\text{mL}}{1000} \Rightarrow \frac{800 \text{ mL}}{1000} = 0.8 \text{ L} \end{aligned}$$

$$M = \frac{0.2 \text{ mol}}{0.8 \text{ L}} = 0.25 \text{ M}$$

2. Calculate the molarity of a solution prepared by dissolving 6.80 grams of  $\text{AgNO}_3$  in enough water to make 2.50 liters of solution. (Answer: 0.016 mol/L).

$$M = \frac{\text{moles}}{\text{liters}} \rightarrow \begin{aligned} \text{moles} &= \text{mass} \div \text{molar mass} \Rightarrow \frac{6.80 \text{ g}}{169.88 \text{ g/mol}} = 0.04 \text{ mol} \\ \text{liters} &\rightarrow 2.50 \text{ L} \end{aligned}$$

$$M = \frac{0.04 \text{ mol}}{2.50 \text{ L}} = 0.016 \text{ M}$$

3. How many moles of  $\text{CaCl}_2$  are required to prepare 2.00 liters of 0.700 M  $\text{CaCl}_2$ ? (Answer: 1.4 moles).

$$\begin{aligned} \text{moles} &= M \times L \\ &= (0.700 \text{ M}) \times (2.00 \text{ L}) = 1.4 \text{ mol} \end{aligned}$$

4. What mass, in grams, of  $\text{CaCl}_2$  will be required to prepare the above solution? (Answer: 155 grams).

$$1.4 \text{ mol} = \text{--- g}$$

$$\begin{aligned} \text{Moles} \times \text{Molar Mass} &= \text{Mass} \\ (1.4 \text{ mol}) \times (110.98 \text{ g/mol}) &= 155.372 \text{ g} \end{aligned}$$

5. How many grams of  $\text{KNO}_3$  will be required to prepare 800 mL of 1.40 M  $\text{KNO}_3$ ? (Answer: 113 grams).



$$\text{Moles} = \text{Molarity} \times \text{liters}$$

$$\text{Moles} = (1.4 \frac{\text{mol}}{\text{L}})(0.8 \text{ L}) = 1.12 \text{ mol}$$

$$\begin{aligned} &\downarrow : 1000 \\ &0.800 \text{ L} \end{aligned}$$


$$\begin{aligned} \text{Mass} &= \text{Moles} \times \text{Molar Mass} \\ &= 1.12 \text{ mol} \times 101.11 \text{ g/mol} = 113 \text{ g} \end{aligned}$$

6. Calculate the volume of a 1.25 M solution of HCN made from 31.0 grams of HCN. (Answer: 0.919 Liters).

$$\boxed{\text{liters} = \frac{\text{moles}}{M}} \rightarrow \text{moles} = \text{mass} \div \text{molar mass} = \frac{31 \text{ g}}{27.03 \text{ g/mol}} = 1.15 \text{ mol}$$

$$\rightarrow 1.25 \text{ M}$$

$$\text{liters} = \frac{1.15 \text{ mol}}{1.25 \text{ M}} = \boxed{0.92 \text{ L}}$$

7. Calculate the volume of a 3.50 molar solution of  $\text{H}_2\text{SO}_4$  made from 49.0 grams of  $\text{H}_2\text{SO}_4$ . (Answer: 0.143 Liters).

$$\textcircled{1} \frac{49 \text{ g } \text{H}_2\text{SO}_4}{98.09 \text{ g/mol}} = 0.5 \text{ mol } \text{H}_2\text{SO}_4$$

$$\textcircled{2} \text{ liters} = \frac{\text{mol}}{M}$$

$$= \frac{0.5 \text{ mol}}{3.5 \text{ M}} = \boxed{0.143 \text{ L}}$$

8. How many sugar molecules are present in 300 mL of a 2.0 M solution? (The formula for sugar is  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ) (Answer:  $3.6 \times 10^{23}$  molecules).

$$\text{mol} = M \times L$$

$$= (2.0 \text{ M})(0.3 \text{ L})$$

$$= 0.6 \text{ mol sugar}$$

$$0.6 \text{ mol} \times (6.02 \times 10^{23}) = \boxed{3.6 \times 10^{23} \text{ molecules}}$$

9. Your teacher asks you to prepare 500 mL of a 2.75 molar solution of NaCl for an upcoming laboratory experiment. Write a step-by-step procedure describing how you would carry out this task.

① Determine how many moles of NaCl you need.

② Convert moles to grams.

③ Add calculated #grams to Erlenmeyer flask.

④ Fill flask with water up to 500 mL of solution.

⑤ Swirl and stir. You have a 2.75M salt solution.

$$\textcircled{1} \text{ moles} = M \times L$$

$$= 2.75 \times 0.5 = 1.375 \text{ mol}$$

$$\textcircled{2} 1.375 \text{ mol} \times \frac{58.44 \text{ g}}{\text{mol}} = 80.4 \text{ g}$$

